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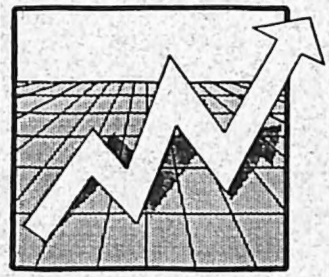

UNIDAD DE INVESTIGACIONES ECONÓMICAS

The Effect of Income Eligibility Restrictions on Labor Supply: The Case of the Nutritional Assistance Program in Puerto Rico

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The Effect of Income Eligibility Restrictions on Labor Supply: The Case of the Nutritional Assistance Program in Puerto Rico

Eileen Segarra Alméstica*

1. Introduction

The effect of welfare programs on labor supply has been debated extensively in recent years. Theory tells us that the design of existing welfare programs promotes a reduction in work effort among recipients. Still, it is not clear whether this disincentive effect is strong enough to have a significant impact on labor supply. It is questionable whether low labor supply among welfare recipients is due to the disincentive effect of the programs or to differences between recipients and non-recipients in their taste for work or their labor market options. Furthermore, little is known about how the interaction of program incentives and labor demand conditions affect the labor supply decisions of welfare recipients. Do welfare recipients react differently to program changes depending on labor market conditions?

The purpose of this study is to investigate the effect of food assistance programs on the labor supply of married households in Puerto Rico. Even though there is extensive literature on the work disincentive effects of US welfare programs, their results may not apply to Puerto Rico. First, the structure of the programs in Puerto Rico is somewhat different from that of US programs. The Food Stamp Program (FS) was introduced in Puerto Rico in 1975, but was eliminated in June of 1982. The Puerto Rican government was then allowed to design its own food assistance program, for which a block grant was assigned. The new program was named the Nutritional Assistance Program (NAP). Unlike FS, this program offers cash assistance. The NAP is the most important public assistance program in Puerto Rico, providing benefits to approximately 40 percent of the population. The other public assistance programs, including Temporary Assistance for Needy Families (TANF), are grouped under the Economic Assistance Program (EAP). The EAP provides benefits to approximately 6 percent of the Island's population. Second, the composition of Puerto Rico's welfare recipient population also differs from that of the US. Almost 50 percent of the households that reported receiving welfare income in 1989 had both spouses present.[1] In 1994, only 16.7 percent of FS households with children in the US were multiple-adult households (US Department of Agriculture 1996). Third, the Puerto Rican economy is very different from the US economy. The poverty rate in Puerto Rico is about four times that of the US. While 40 percent of the Island's population receives food assistance benefits, the corresponding figure for the US is less than 10 percent (Green Book 1992). In addition, the unemployment rate in Puerto Rico is at least twice as high as in the US.

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[1] This estimate was obtained by tabulation of the 1990 Census Public Use Microdata Sets for Puerto Rico. The sample used excludes households headed by a disabled person.

This paper focuses on the effect of the 1982 NAP reform. Since the block grant amount determined at that time was lower than the funding received by the Island's government under FS, program costs had to be reduced. To reduce administrative costs the new program was designed as an in-cash program. In order to reduce the caseload, the eligibility requirements were tightened by decreasing the asset, gross income and net income limits. Costs were also reduced by decreasing the maximum benefit levels. The most important change was the reduction in the maximum gross income that a family is allowed to receive and still be eligible for the program (gross income limit). The number of Puerto Ricans receiving food assistance declined by about 8 percent between June of 1982 (last month under FS) and July of 1982 (first month under NAP).

Studying this reform is especially interesting given that the welfare reform legislation recently implemented in the US replaces the AFDC program with a block grant to states. As a result, in the event of a recession many states will be forced to reduce program costs. They may choose to restrict eligibility as did Puerto Rico in 1982. In a recessionary US economy, the Puerto Rican experience will become more relevant. Therefore, understanding the possible consequences of eligibility restrictions becomes very important.

The study focuses on married couples for various reasons. First, even though a small percentage of married couples reported receiving welfare income in 1989, they comprised a large portion of all households reporting welfare income. Second, the reform affected welfare recipient households with relatively high earnings which are disproportionately married couples. Third, previous studies have found that married women have relative high labor supply elasticities.[2] If there is a reaction to the policy change it is likely to come from wives. Lastly, married couples for the most part are not eligible for other programs. Therefore, by focusing on them, food assistance program interactions with other welfare programs can be avoided.

Households with earnings between the old and the new gross income limits are the ones most affected by the reform. Households in this range became ineligible to participate in the program. The expected reaction of these households is ambiguous. On the one hand, these households may decide to reduce labor supply in order to maintain program eligibility. On the other hand, the decrease in the program's caseload implies that some households opted for exiting the welfare rolls. For these households, both the substitution and the income effect predict an increase in labor supply. Since not all eligible households choose to participate in the program, whether or not a household is affected by the reform also depends on its likelihood of participating in welfare.

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[2] For estimates of married women labor supply elasticities see Mroz (1987), Triest (1990), Eissa (1995) and Blundell et. al., (1996).

The effect of the reduction in the gross income limit is estimated using a natural experiment methodology. Observations are divided according to budget constraint location and welfare participation probability. The main treatment group consists of those households, located between the old and the new gross income limits, which also have a high probability of participating in welfare programs. This group's change in labor supply is compared to labor supply changes of those located above the old gross income limit and of those located in the same budget segment but with low welfare probability.

There is no evidence indicating that households that exited the welfare rolls increased their labor supply, even though their marginal tax rates decreased by approximately 57 percent. This may be explained by low labor supply elasticities or by labor market constraints. This last explanation seems likely given that, in the sample, low educated workers experienced a decrease in labor supply relative to college graduates around the time of the reform. Labor supply trends across education groups are consistent with the hypothesis that minimum wage legislation has a restrictive effect on the labor market.

There is some evidence indicating that wives may have reduced total hours worked as a result of the reform. Wives in households with high welfare probability and whose husbands' earnings are closed to the new gross income limit experienced a relative decrease in hours of work. The same is true for wives with high welfare probability and 12 years of education. The size of the effect is estimated to range from 13 to 19 percent.

Section 2 describes the Puerto Rican welfare system and the creation of the Nutritional Assistance Program. A general view of the Puerto Rican economy and the role of welfare programs in Puerto Rico is presented in section 3. Section 4 discusses the disincentive effect of welfare programs and the changes in the household budget constraint brought about by the reform. A review of the literature is presented in section 5 and the data is described in section 6. Section 7 presents the natural experiment methodology and summarizes the results. Concluding remarks are presented in section 8

2. The Welfare System in Puerto Rico

As a commonwealth, Puerto Rico receives funding from the US federal government for welfare programs, but this funding is lower than the amount that the Island would received if it was treated as a state. The programs are divided into two categories, the NAP and the EAP, both of which offer cash benefits. Under the Economic Assistance Program there are five categories of participants: the elderly, the blind, TANF participants, children's legal guardians and general assistance participants.[3] The

[3] The AFDC program preceded the TANF program before the implementation of the federal welfare reform.

programs for the elderly and the blind do not receive direct federal funding. Their benefits are subject to availability of funds. The same is true for the general assistance program, which serves adults with temporary disabilities and children with permanent disabilities. All program participation requires total income and assets to be below the limits set by the programs.

The NAP maximum benefit for each family size is about 25 percent less than the Food Stamp benefit in the 48 contiguous states and the District of Columbia. Also, different rules are used in counting income for eligibility and benefit purposes. Net income is calculated by subtracting standard and other deductions from family income. The average monthly family benefit is $166, approximately 20 percent of median family income. In 1996, Puerto Rico received $1.1 billion in Federal Funds for this program. The formula used to calculate food assistance benefit claims is similar to that used in the US. NAP's benefits are calculated as follows;[4]

$$\text{Benefit Claim} = [\text{Max. Benefit} - (0.3)^* \text{ Net income}]$$

In 1995, the AFDC funding for the Island was capped at $82 million,[5] resulting in an average monthly benefit of $32 per adult and $24 per child. To put the economic significance of these payments in perspective, I calculated the average monthly family payment as a percentage of median monthly family income for each of the fifty states, the District of Columbia and Puerto Rico. The corresponding percentage for Puerto Rico is 12.2 percent. This is lower than the corresponding percentage for California (18.1 percent) but more than double the corresponding percentages for Mississippi (5.8 percent) and Alabama (4.8 percent). If all states and Puerto Rico are ranked using this generosity criterion, Puerto Rico would rank twenty-first. In absolute value, benefits in Puerto Rico are lower than benefits in any US state. To be able to compare the standard of living of Puerto Rican recipients with their US counterparts, we would need to compare costs of living among each of the fifty states and Puerto Rico. Unfortunately, the price indexes available for Puerto Rico are not comparable to those available for the US. In Puerto Rico, between 1983 and 1993, the number of participating households increased by 6.4 percent. As of 1995, 6 percent of the Puerto Rican population received benefits through the Economic Assistance Program

The Puerto Rican government does not receive any funding for the Supplemental Security Income Program (SSI). The SSI eligible population (which includes the elderly, the blind and the disabled) is funded under the EAP. The monthly benefit for an elderly

[4] In Puerto Rico, the benefit claim is multiplied by the ratio of funds available to total benefit claims in order to determine the amount of benefits to be paid out.

[5] This amount is expected to decrease due to the recent welfare reform.

person is $32 and for the blind it is $37. As with SSI, no federal funding is available under the Earned Income Tax Credit[6] and other child protection programs.

FS was introduced in Puerto Rico in 1975. In 1982, food assistance changed from FS to a cash program. At that time, the amount of funding was reduced. In response, the standards were modified and the verification requirements were tightened.

2.1 The Creation of the Nutritional Assistance Program

Once FS was introduced in Puerto Rico, participation in the program increased rapidly. By 1976 approximately half the people in the Island were receiving benefits under this program. This high rate of participation for the population overall was due to the fact that income levels in Puerto Rico are much lower that in the US.[7] Therefore, when the program's standards (designed for the US) were applied to Puerto Rico, a large percentage of the population qualified to receive benefits. The increasing cost of the program on the Island prompted the federal government to substitute a block grant for Puerto Rico's participation in the Food Stamp Program. The differences between the two programs can be summarized as follows:

- In order to maintain an entitlement program with a fixed amount of funding, a percentage adjustment rate is used to determine the level of benefits to be paid out to the NAP's participants.[8] The percentage adjustment rate is equal to the amount of monthly available funds divided by the estimated value of all benefit claims. Each participant's benefit claim is then multiplied by the adjustment rate. The resulting amount is the benefit to be paid to him/her.

- The block grant amount determined in 1982 was lower than the funding previously received by the Island's government under Food Stamps. This implied that changes needed to be made in order to reduce costs. To reduce administrative costs the new program was designed as an in-cash program. In order to reduce the caseload, eligibility requirements were tightened by decreasing the asset, gross income and net income limits. For example the gross income limit for a family of four was reduced from $916 to $667 a month, approximately 86 percent of the US poverty line for this family size. [9] Costs were also reduced by decreasing the maximum level of benefits.

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[6] Puerto Rico's residents do not pay federal taxes unless they receive income from special sources.

[7] In 1990, median income in Puerto Rico was 40.8 percent of that of Mississippi, the poorest state in the US.

[8] Since September 1996 the percentage adjustment rate is being calculated every three months instead of monthly.

[9] FS gross income limits correspond to 130 percent of the poverty line for each family size.

- Other small changes were implemented. The earnings deduction was increased from 18 to 20 percent. The standard deduction was decreased from $50 to $40, and a cap on the medical deduction for elderly and disabled recipients of $100 was imposed. [10]

From 1979 to the first half of 1982, the Food Stamp caseload in Puerto Rico was approximately 500,000 households. The average number of Puerto Ricans receiving food assistance declined by about 8 percent between June of 1982 (last month under FS) and July of 1982 (first month under NAP, General Accounting Office 1992). During the first six months of the NAP the number of households receiving food assistance decreased by 90,000, a seventeen percent reduction. By September of 1984 the number of participating households has fallen to approximately 405,000. This reduction was due to a decrease in the number of new cases and an increase in termination of benefits to current participants. During the first 6 months of the new program, the number of new cases fell by 28 percent, while between 29,900 to 38,900 cases were discontinued when reevaluated under the new program rules. It has been estimated that 84 percent of the caseload reduction was due to households becoming ineligible because their earnings were too high to qualify for the new program. After the first year of the NAP, the number of participating households with earned income decreased from 184,400 to 105,100. The other group greatly affected was Social Security recipients. In June 1982 there were 134,000 FS recipient households receiving Social Security. By June 1983, that number had fallen to 104,000 (Mathematica Policy Research, Inc. 1985).

A second reform was implemented in 1988. At that point the shelter deduction was eliminated. The earnings deduction was increased from 20 to 40 percent with a minimum of $100 and a maximum of $300. The increase in the earnings deduction reduced the implicit marginal tax rate from 0.24 to 0.18. Also, a new deduction of $100 per full-time college student in the household was established.

3. The Puerto Rican economy

To understand the effect of welfare programs in Puerto Rico, various facts about the Puerto Rican economy should be mentioned. Table 1 compares estimated poverty rates for Puerto Rico and the US for selected years. Even though the gap has been falling, the rate in Puerto Rico is still approximately four times that of the US. According to estimates from the Census Bureau, in 1993 sixty-eight percent of children ages 5 to 18

[10] All deductions, including the earnings deduction, are substracted from gross income before the benefit reduction rate is applied.

living in Puerto Rico were in poverty. The corresponding percentage for the US was 20.4 percent.[11]

As of 1995, 58 percent of the Puerto Rican population was living below the federal poverty line. Also that year, 39 percent of families received benefits through the NAP and 6 percent received benefits through the Economic Assistance Program (Department of Social Services of PR, internal memo 1996).

It is also important to notice the high unemployment rate and low labor force participation level. As can be seen in table 2, the unemployment rate increased sharply during the mid 1970's. Two factors that may have contributed to this trend were the increase in the minimum wage and the oil crisis. Before 1973, minimum wages in Puerto Rico were lower than in the US. The Minimum Wage Board in Puerto Rico recommended exemptions to the US statutory minimum on an individual industry basis. Starting in 1973, industry specific exemptions were gradually eliminated. Most industries achieved parity with the US minimum between 1977 and 1983. By 1977 the ratio of the minimum wage to the average wage was above 85 percent for most industries. Studies conducted by Santiago (1989), Santiago and Thorbeck (1988) and Freeman and Castillo (1991) find a positive relationship between increases in the minimum wage and the level of unemployment. Krueger, on the other hand, does not find the same effect. The increase in the minimum wage eliminated Puerto Rico's comparative advantage in labor intensive production. As a result, the Island's government focused on attracting investment in capital intensive industries, but these did not create the forward and backward linkages that were expected. These changes may explain why the unemployment rate has remained very high. The labor force participation rate declined during the late 70's and early 80's. Even though there is an increasing trend after 1983, the labor force participation rate was still 2 percentage points lower in 1992 than it was in 1971. One aim of this paper is to examine whether the increase in labor force participation in 1983 was related to the new food assistance program eligibility restrictions. For males, the participation rate went from 70.8 percent in 1970 to 61.8 percent in 1992. On the other hand, the female participation rate increased from 28 percent in 1970 to 33.2 percent in 1992. These are considerably lower than the male and female labor force participation rates for the US. In 1992, US labor force participation rates for males and females were 75.8 percent and 57.8 percent, respectively. Figure 1 shows the trends in unemployment rate for PR and the US from 1979 to 1992. The trends are very similar except for the period between 1984 and 1985.

[11] This information was obtained on line at http://www.census.gov/ftp/pub/hhes/www/poverty.html

4. Incentives Effects of Food Assistance Programs in Puerto Rico.[12]

The typical budget constraint confronted by a family under the NAP is shown in Figure 2. H_1 denotes the hours of work at which household earnings are equal to the amount of non-income related deductions allowed by the program. Up to that point, net income increases by one dollar for each additional dollar of earnings. H_2 are the hours of work at which household earnings are equal to the gross income limit. H_3 denotes the hours of work that would yield family earnings equal to the value of net income at H_2. The notch in the budget constraint is due to the fact that most families will reach the gross income limit before their benefits are reduced to zero.

If utility is an increasing function of leisure and income, the program is expected to have a negative effect on labor supply. First, the payment guarantee (G) is expected to increase the demand for leisure and cause a decrease in labor supply. If hours worked are below H_1, the disincentive effect on labor supply comes from this income effect. If hours of work are above H_1, the NAP benefit is reduced by approximately 24 cents for each additional dollar of income. This implicit marginal tax rate decreases the net wage creating a negative substitution effect on hours worked. Households working between H_1 and H_2 are expected to decrease hours worked due to both, the income effect caused by the benefit payment and the substitution effect caused by the implicit tax rate.

The negative income effect will influence the labor force participation and hours of work decisions of the primary as well as secondary earners. The substitution effect is likely to affect the labor force participation decisions of secondary workers, as well as, the hours of work decision of both primary and secondary earners. The labor force participation of the primary earner may not be affected by the substitution effect as long as he or she has the flexibility of working less than H_1. For most families the amount of non-income related allowable deductions is small. If the choice of hours of work is not flexible, the entrance of the primary earner to the labor force may move the household beyond H_1. In such a case, the substitution effect will also have a negative effect on the labor force participation decision of the primary earner.

If household earnings reach the gross income limit, the implicit marginal tax rate will be above one hundred percent. The existent of a notch in the budget constraint creates an even bigger labor supply disincentive effect for those households located close to H_2. Increasing hours of work at that point will decrease net income, unless hours of work are increased beyond H_3.

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[12] Hereafter the term welfare will be used to denote food assistance programs. For the sample under study this is the only public assistance program available.

4.1 Changes in the Household Budget Constraint Caused by the Reform.

The family budget constraint before and after the reform is shown in Figure 3.[13] The budget constraint obtainable under FS is given by ACFG. The NAP budget constraint corresponds to ABDEG. G_f is the maximum benefit under FS and G_n is the maximum benefit under NAP. The hours of work that correspond to the NAP and FS gross income limits are denoted by H_1 and H_2, respectively.

There are three major changes in the household budget constraint caused by the reform. The most important one is the reduction in the gross income limit. This reduction decreases the consumption options for households with hours of work between H_1 and H_2. The reduction in the gross income limit also creates a deeper notch in the budget constraint.[14] For each household, the size of the notch will depend on family size. Larger families will confront a bigger notch. Under FS, benefits for one or two person families are eliminated before the household's income reaches the gross income limit, therefore there is no notch in their budget constraint. Larger families will reach the gross income limit before benefits are reduced to zero, creating a notch in their budget constraint. Under NAP, the gross income limit is approximately 27 percent lower than under FS. As a result, most families participating in NAP face a notch in their budget constraint because they reach this lower gross income limit before their benefits are reduced to zero. Lastly, there is a slight decrease in G.[15] Table 3 shows the change in the gross income limit by family size and the value of the notch after the reform.

This study focuses on married households for various reasons. First, even though a small percentage of married households reported receiving welfare income in 1989, they comprised almost 50 percent of all the households that reported welfare income.[16] Second, the group most affected by the reform consists of those households with higher earnings among welfare recipients. These are more likely to be married couples. The other 50 percent of welfare recipients are female headed households which on average received very low earnings. Third, previous studies have found that married women have relatively high labor supply elasticities. If there is a reaction to welfare reform it is likely to come from them. Finally, by focusing on married households, complications caused by interactions with other public assistance programs can be avoided.

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[13] Deductions are ignored for simplicity.

[14] Food Stamp benefits are determined according to the "thrifty food plan." This plan determines the minimum amount of food expenditure necessary for a healthy diet, given family size. At the same time, the gross income and net income eligibility limits are defined according to the level of income as a percentage of the poverty line.

[15] Even though the maximum benefit decreased by approximately 10 percent, the percentage adjustment rate between July 1982 and December 1982 averaged 8.7 percent, therefore the decrease in actual benefits paid out was very small.

[16] This information comes from author's tabulations using the 1990 Public Use Microdata Set for Puerto Rico.

The theoretical framework to be used is the standard utility maximization model. Utility is defined as an increasing function of income and leisure. Households with hours below H_1, are affected by a slight decrease in benefits that is accompanied by an increase in uncertainty due to the percentage adjustment rate. Both effects should induce an increase in labor supply. Nevertheless, these changes may be too small to have an effect. Households with hours of work between H_1 and H_2 are the ones most affected by the reform. Households in this range became ineligible to participate in the program due to the reform. The expected reaction of these households is ambiguous. On the one hand, these households might decide to move to the kink by reducing labor supply. On the other hand, they might decide to work more than H_3. As mentioned in section 2.1, the program caseload decreased. For those households that exited the welfare roll, both the substitution and income effect predict an increase in labor supply. In 1982, the calculated average benefit received by families in this range was approximately 6 percent of the average couple's earnings. That represents the average amount of transfer payment income that these families lost due to the reform. The estimated reduction in their marginal tax rates after the reform is approximately 57 percent. This translates into a net wage increase of 40 percent. Households with hours worked above H_2 should not be affected by the reform.

Changes in labor supply could come from either the husband or the wife. If husbands behave as primary earners and wives as secondary earners, then the budget constraint confronted by the husband is the same as the household budget constraint. Since the reform mostly affected households that are already earning income, changes in husbands' labor supply are likely to come from hours worked and not labor force participation. The wives' incentives due to the reform will depend on their husbands' earnings. Those with husbands whose earnings are above the FS gross income limit should not be affected by it. Those with husbands whose earnings are between the old and the new limits will experience a reduction in marginal tax rate and unearned income, and are therefore expected to increase labor supply. For wives with husbands whose earnings are below the new limit the effect is not clear. On the one hand, the benefits were slightly reduced and became more uncertain due to the percentage adjustment rate. This should induce an increase in work effort. On the other hand, wives may reduce work effort to avoid reaching the new gross income limit.

The assumption that wives behave as secondary earners has been commonly used in the literature on married couples' labor supply. The low labor force participation of wives in Puerto Rico may be an indication that this assumption is likely to hold for most households. On the other hand, the presence of high unemployment may restrict households' labor supply choices. It is possible that many working wives are forced to take on the primary earner role by economic circumstances.

The empirical analysis looks at changes in labor supply of husbands and wives across groups. The groupings are done according to: predicted welfare participation probability, predicted location on the budget constraint prior to the reform and education levels. Wives are also grouped according to husbands' earnings.

5. Review of Literature

Many researchers have examined the effect of public assistance programs on labor supply in the US. (See Moffitt (1992) and Hoynes (1996a) for recent summaries.) An extensive discussion of the effect of AFDC on the labor supply of female heads of households preceded the 1996 US Welfare Reform. Most studies find that the disincentive effects of AFDC induce female heads of households to decrease their labor supply, on average, between one to ten hours per week. These results imply that the increase in labor supply that may come as a result of the elimination of this type of programs would not be enough to bring these households over the poverty line.

There are two studies more closely related to the question addressed in this paper. Fraker and Moffitt (1988) is the only study that looks at the effect of FS on labor supply. They find that FS reduces hours worked by female heads by approximately one hour per week. This result is small but statistically significant. Hoynes (1996b) studies the effect of the Aid to Families with Dependent Children Unemployed Parent Program (AFDC-UP) on the labor supply of two-parent households. The AFDC-UP provided cash assistance to married couples, as the NAP does. She finds these households to be highly responsive to changes in the benefit structure of the program. As explained in the introduction, these results may not apply to Puerto Rico given the differences in program structure and economic conditions.

This paper contributes to three areas of research: the effect of welfare programs on labor supply in Puerto Rico, the effect of food assistance programs on labor supply and the responsiveness of married households to the work disincentive effects of welfare programs. The Puerto Rican case is especially interesting because it permits us to study the disincentive effects of welfare programs in the presence of high unemployment.

6. Data

The data used in the empirical analysis comes from the Puerto Rico Monthly Households Survey (MHS) for the month of April from 1982 to 1985. This survey is administered by the Puerto Rican Department of Labor and is similar to the basic US Current Population Survey (CPS). It does not, however, include any monthly supplements as does the CPS and the questions asked are more limited. Questions regarding hours worked refer to the week previous to the interview. The data does not include information about welfare participation, and the only measure of income included

is the previous week's earnings. It contains indicators for region, zone and municipality of residence.[17] This data is only available beginning in 1982.

The sample used consists of married couples living in households that do not include any members aged 60 or above, who are disabled or who are not relatives.[18] There are two reasons to exclude these households. First, they are subject to different NAP rules and are allowed deductions that are hard to ascertain. Second, and more importantly, these households are likely to have other unearned income sources such as general assistance, Social Security or retirement income. These sources of income can make the family ineligible for the NAP program even when household earnings are below the gross income limit. Households in which either the wife or the husband is self-employed are also excluded due to suspicious income reporting. The analysis only uses data on households with no missing income for the husband and the wife. The final sample consists of 6,239 households. Sample characteristics are summarized in table 4. Table 5 contains sample characteristics of working husbands and wives.

To compensate for the lack of welfare participation information, data from the census 1990 Puerto Rico Public Use Microdata Set (PUMS) was used. The PUMS data contains detailed income categories, one of which is welfare income, and has a bigger sample size.[19] Using PUMS data, it was verified that most households in the MHS data are not expected to receive unearned income other than welfare income. Only one percent of the PUMS sample received other unearned income in 1989. Data from the PUMS was also used to estimate an equation to predict the probability of receiving welfare income given household characteristics. First a sample similar to the MHS sample is selected. A welfare dummy is set equal to one if the household received welfare income during 1989. A logit equation is estimated by regressing the welfare dummy on demographic characteristics of the husband and the wife, ages and number of children, regional unemployment, and the gender of the main earner. The resulting equation is then used to calculate a predicted welfare participation probability for the MHS sample. It would have been preferable to use PUMS data from 1980 (before the reform) to estimate the welfare participation probability equation. Unfortunately, in 1980 FS was not an in-cash program and therefore its benefits were not counted as welfare income by the 1980 Census.

Information on yearly unemployment rates for 14 regions was obtained from the PR Department of Labor. These 14 regions are defined in terms of the municipalities

[17] A municipality is equivalent to a county in the US.

[18] Most of the households excluded on the basis that there was a member 60 years or older were actually headed by a senior member.

[19] After selecting a sample comparable to the one used from the MHS data, the number of observations in the PUMS sample was approximately 19,000.

included in each. Since the MHS data contains municipality of residence, the matching of unemployment rates to observations was straightforward.

7. Methodology and Results

7.1 Empirical Approach

The basic technique commonly used in analyzing natural experiments is the differences in differences approach. The treatment effect is estimated as:

$$\beta = (\overline{Y}_{T1} - \overline{Y}_{T0}) - (\overline{Y}_{C1} - \overline{Y}_{C0})$$

Where:

β = treatment effect

$\overline{Y}_{T1}$ = mean outcome variable for the treatment group post- treatment

$\overline{Y}_{T0}$ = mean outcome variable for the treatment group pre- treatment

$\overline{Y}_{C1}$ = mean outcome variable for the control group post- treatment

$\overline{Y}_{C0}$ = mean outcome variable for the control group pre - treatment

This estimation can also be extended to a regression framework that allows us to control for differences in observable characteristics between the groups. The equation to be estimated is:

$$y_i = \alpha X_i' + \gamma_0 d_t + \gamma_1 d_j + \beta d_{ij} + \varepsilon_i$$

where :

y_i = the outcome variable

X'_i = a vector of socio - demographic characteristics

d_t = a time dummy equals to one if after treatment

d_j = an indicator variable for the treatment group

d_{ij} = the interaction of d_t and d_j

β = the treatment effect.

Hereafter this regression framework will be referred to as the differences in differences (DD) regression.

Sometimes, whether an individual is affected by the treatment depends on more than one characteristic. Therefore, the definition of the treatment group depends on more than one indicator. This framework can easily be extended to cover the case where the treatment is defined by the interaction of more than two variables. The regression to be estimated in such a case is:

$$y_i = \alpha X_i' + \gamma_t d_t + \gamma_j d_j + \gamma_k d_k + \lambda_1 d_{ij} + \lambda_2 d_{ik} + \lambda_3 d_{kj} + \beta d_{ijk} + \varepsilon_i$$

where:

d_j and d_k are the variables that determines the treatment group

d_{ij}, d_{ik}, and d_{kj} are the first order interactions of the three variables that determines the treatment

d_{ijk} is the second order interaction of the group indicators and the time dummy.

Its coefficient β is the treatment effect.

All individual group and time dummies, as well as their first order interactions, should be included in the regression. Hereafter, this extended regression will be referred to as the differences in differences in differences (DDD) regression.

The main advantage of the natural experiment approach is that there is a clear source of exogenous variation that can be used to identify the parameters that describe the treatment effect. Nevertheless, there are various relevant caveats. First, it is possible that the policy change used may actually be endogenous.[20] In that case, the change in the outcome variable may be the reason for the change in policy and not the other way around. It is also possible that the differences in outcome between the treatment and the control group are due to differences in time trends. Also, such differences may be due to possible interactions between omitted variables and time variables and not to the treatment effect. Meyer (1995) discusses in detail these caveats and possible ways to control for them. The issue of differences in time trends between the groups can be examined by looking at multiple pre and post- treatment periods and comparing the relative changes in outcome during those periods. The use of multiple control groups is also recommended whenever possible to control for differences in group unobservable characteristics.

In this case, the outcome variables of interest are labor force participation and total hours worked per week for husbands and wives. Ideally, we would like to observe earnings and welfare participation for each household before and after the reform. With such information we could compare changes in the labor supply of households that received welfare and had earnings between the old and the new limits in 1982 with that of households that did not. Unfortunately, this information is not available. For this reason, different groupings are used to test the consistency of the results. Observations are grouped according to predicted welfare participation, predicted household budget constraint location in 1982, and husbands' earnings. Groupings by education levels are used to distinguish the effect of the reform from differences in labor market trends between groups. All regressions used for the DD and DDD analyses include controls for

[20] For a detailed discussion see Besley and Case (1995)

age, education, number of children, household size, unemployment rate and regional dummies. Wives' regressions also control for the number of children under five years of age.

7.2 Results by Groupings

Groupings by Predicted Welfare Probability

Only households that are likely to participate in welfare programs would be affected by programs changes. Therefore, it seems logical to start by defining the treatment group as those with a high predicted welfare probability and the control group as those with a low predicted probability. High welfare probability is defined as a predicted welfare probability greater than 0.50.

The treatment effect is calculated as the difference between changes in mean outcome variables for the treatment group (those with high welfare probability) and the control group (those with low welfare probability). The analysis is then extended to a regression framework to control for differences in observable socio-demographic characteristics between the treatment and the control group. Instead of using a dummy variable for the treatment group, the regression uses the predicted welfare probability as the group indicator. The equations are estimated using the DD regression framework. The labor force participation equations are estimated using a probit regression. The hours of work equations are estimated using ordinary least squares (OLS). In each regression, the treatment effect is estimated as the coefficient of the time dummy and the predicted welfare probability interaction.

Table 6 presents the results. Panels 6a and 6b present the means comparison results for wives' labor force participation and total hours worked, respectively. The labor force participation effect (shown at the bottom of the panel) is negative but insignificant. The hours worked effect is estimated to be -1.38 hours per week and is significant at a 10% level. Panels 6c and 6d present the corresponding results for husbands. None of the treatment effects are statistically significant.

Panel 6e presents the treatment effects estimated as the coefficient of the interaction between the time dummy and the welfare probability, using DD regression framework. The regressions results are very similar to those obtained through the means comparisons. The top half of the table presents the wives regressions results, followed by the husbands regressions results below. The second column shows the labor force participation effects. These are insignificant for husbands and wives. The hours worked effects are presented in the third column.. The treatment effect coefficient in the wives hours equation is -4.44 and is highly significant. To estimate the size of the effect, this coefficient is multiplied by the standard deviation of the interaction variable (0.27). The

resulting effect is a reduction of 1.2 hours per week, which is equivalent to 13.4 percent of mean hours worked by wives in the sample (8.97). The coefficient in the husbands hours of work equation is -2.71 with a p-value of 0.15. This translates into a reduction of 0.73 hours per week or 3 percent of mean hours worked by husbands in the sample (23.93).

There are two limitations to this analysis. First, the control group may be substantially different from the treatment group. Second, as explained in Section 4.1, the expected response to the reform depends on which segment of the budget constraint the household is in prior to the reform. Both will be handled as extensions to these results.

Groupings by Predicted Budget Constraint Location

Given that actual budget constraint location is endogenous to labor supply choices, one of the treatment indicators used is the predicted probability of locating in a specific segment of the budget constraint. For our purposes, the budget constraint can be divided into three segments. The first segment corresponds to earnings below the new gross income limit. The second segment corresponds to earnings between the new and the old gross income limits. The third segment corresponds to earnings above the old gross income limit. Inclusion in the treatment group also depends on the household's predicted welfare participation probability. The main treatment group consists of households with high predicted probabilities of locating in segment two of the budget constraint and participating in welfare programs. These are the households more likely to lose eligibility due to the reform. A second treatment group is also added to the regression. It consists of households with high probability of receiving welfare and locating on segment 1 of the budget constraint. These households may be affected by the eligibility restrictions if they are close to the cutoff, and by other minor changes in the program.

The probability of being in each segment of the budget constraint is estimated using an ordered probit regression. Since the relevant budget constraint location is the one prior to the reform, only data for 1982 is used to estimate this equation. The variables used to estimate the predicted probabilities include the following: husband's and wife's age and age squared, up to third order terms for husband's and wife's education, total number of children, number of children under 5 years of age, household size, regional dummies and unemployment rate. This equation is then used to predict the probabilities for the entire sample.

It is advantageous to use the probability of locating in a certain segment of the budget constraint instead of a 0/1 dummy because it contains more information. This is especially important in this case, given the following estimation difficulties. First,

segment two is the smallest segment of the budget constraint. In addition, it is also the middle one. The combination of these two factors makes it difficult to identify the observations that belong in this segment and accurately assign them to segment two using arbitrarily set cutoffs. Even though this exercise is probably the most consonant with the question being asked, the results have to be interpreted carefully given this constraint.

Table 7 presents the treatment effect estimated using a DDD regression. The treatment effect is estimated for the two treatment groups mentioned earlier. It is defined as the coefficient of the interaction of the time dummy, the predicted welfare probability and the predicted probability of the locating in segment one or segment two of the budget constraint, depending on the treatment group of interest.

The top half of the table presents the estimated labor force participation and hours worked effects for wives in both treatment groups. For wives with a high probability of receiving welfare and locating on segment two of the budget constraint, the participation effect is negative but insignificant. The hours worked effect is practically zero. For wives with a high probability of receiving welfare and locating on segment one of the budget constraint both effects are highly insignificant.

The bottom half of the table presents the estimated treatment effect for husbands. Those with high probability of receiving welfare and locating on segment two of the budget constraints may have experience a decrease in labor supply. The hours worked effect is equivalent to a reduction of 1.1 hours per week and has a p-value of 0.13.[21] The hours worked effect for husbands with high probabilities of receiving welfare and locating on segment one of the budget constraint corresponds to an increase of 2.05 hours per week, and has a p-value of 0.12.

None of the results in this section are statistically significant using conventional values. Nevertheless, the results indicate that among the group more likely to lose eligibility the labor supply did not increase. In any case, there may have been a negative effect on labor supply.

Groupings by Husbands' Earnings.

The labor supply effect on wives can also be estimated under the assumption that wives behave as secondary earners, and their responses to the reform depend on their husbands' earnings. The are two groups of women that may be particularly affected by the reform. Those are the wives with husbands' earnings close to the new gross income limit and the wives with husbands' earnings between the old and the new limit.

[21] The effect is estimated by multiplying the regression coefficient by the standard deviation of the interaction variable.

The first group of wives is likely to experience a decline in labor supply. Their husbands' earnings put the household close to the notch in the budget constraint. Therefore, these wives have two options. The first option is to increase their labor supply substantially in order to move the household above H_3 in figure 3.[22] This implies an improbable large increase in labor supply. The second option implies a reduction in labor supply to avoid loosing eligibility for the program.

A priori, we may expect the second group of wives to experience an increase in labor supply. These households lost eligibility due to husbands' earnings. Due to the income and substitution effect described earlier, the household is expected to increase labor supply. The literature tells us that wives tend to have more elastic labor supply. It is also known that a considerable number of households lost eligibility due to their earnings. Considering these two facts, we may think that if there was an increase in labor supply due to the reform it should probably come from this group.

The results of this experiment are presented in table 8. Following the DDD framework, the treatment effect for both groups is defined as the coefficients of the interactions between the time dummy, the welfare probability and the corresponding husband's earnings dummies. The first earnings dummy is equal to 1 if the husband's earnings are within $300 of the NAP gross income limit.[23] The second earnings dummy is equal to one if the husband's earnings are between the old and the new gross income limit.

Table 8a shows the estimated labor force participation and hours worked treatment effects for both groups. As expected, both estimated treatment effects for wives with husbands' earnings close to the new limit and high welfare probability are negative and have a p-value smaller than 0.10. For this group, the derivative of the labor force participation probability function with respect to the treatment indicator is -0.23. When the derivative is multiplied by one standard deviation of the interaction variable, the resulting effect corresponds to a 3.5 percentage points reduction in the participation probability. The estimated size of the hours of work effect is -1.2 hours per week. For wives with husbands' earnings between the old and the new gross income limit and high welfare probability, both estimated treatment effects are negative and highly insignificant.

It is possible that, within the second group, wives react differently according to whether they are closer to the old limit or to the new limit. There are at least two possible reasons why those closer to the new limit may not increase labor supply. First, due to

[22] H_3 corresponds to the number of hours of worked that allows the household to received earnings equal to the sum of earnings and benefits received at the gross income limit.

[23] This cutoff was selected because, given the minimum wage at the time, a person working 20 hours a week at minimum wage would have received close to $300 a month.

measurement error some of the husbands may be earning less than the limit. Second, if the amount by which earnings surpass the limit is small there may be forms to concealed this income or get an exemption. With this in mind, the experiment is repeated with three treatment groups instead of two. The second treatment group in the preceding exercise is broken up into two groups. The break point used is the midpoint between the new and the old gross income limit.

The new results are presented in table 8b. As should be expected, the results for wives with husbands' earnings within $300 of the new limit and high welfare probability remain unchanged. The estimated effects for wives with husbands' earnings between the new limit and the midpoint and high welfare probability are negative and insignificant. The results for wives with husbands' earnings between the midpoint and the old limit and high welfare probability are positive but insignificant.[24]

Groupings by Education Levels

As already mentioned, the analyses previously presented rely on the assumption that labor market trends are similar for the treatment and the control group. Since the data is only available starting on January 1982, pre-treatment trends can not be observed. Nevertheless, the treatment and control groups used in previous comparisons are likely to have different education levels. One way to analyze the effect of differences in labor market trends is by looking at changes in labor supply across education groups. The sample can be divided in four different groups according to years of education; 11 years or less, 12 years, between 12 and 16 years, and 16 years or more (college graduates). Figure 4 shows the trends in average wage, labor force participation and hours of work for these education groups. As can be seen from the figure, the labor market trends of highly educated individual differ from the trend of the other three groups, especially between 1983 and 1986.

One way to distinguish the effect of the reform is to look at labor supply changes within education groups. Most welfare recipients will be among the two groups with lower levels of education; less than 12 years of education and 12 years of education. Identification relies on the assumption that within a given education group all observations are affected by the same labor market trends. Therefore, differences within education groups across individuals with different welfare probabilities are attributed to the reform.

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[24] Additional regressions were estimated, focusing on wives with husbands' earnings between the two limits. These regressions examine the importance of measurement error problems by varying the width of the budget segment. The smallest range used extends from 110 percent of the NAP limit to 90 percent of the FS limit. The widest range used covers from 85 percent of the NAP limit to 115 percent of the FS limit. The results are very similar to the one presented above. Those closer to the NAP limit show a negative but insignificant labor supply response. The response of those closer to the FS limit was positive but also insignificant.

Among welfare recipient, those with 12 years of education are the most likely to be affected by the gross income limit reduction. This group has a high level of education compare to other welfare recipients. Therefore, we should expect to see more of these households receiving earnings.[25]

The initial DD analysis that uses the welfare probability as the group indicator is repeated for each of the two lower education groups. Table 9 presents the means comparison results for wives. High welfare probability is defined as a probability of receiving welfare greater than 0.5. Panels 9a and 9b compare the change in labor participation between those with high welfare probability and those with low welfare probability, within each education group. Among wives with 12 years of education, those with high welfare probability experienced a significant decrease in labor force participation relative to those with low welfare probability. When we compare across education groups, those with 12 years of education and high welfare probability also experienced a significant decrease in labor force participation relative to those with less than 12 years of education and high welfare probability. The across group comparison result is presented in panel 9c.

Panels 9d to 9e repeat the previous analysis using total hours worked as the dependent variable. Wives with 12 years of education and high welfare probability also experienced a significant decrease in total hours worked relative to those with 12 years of education and low welfare probability. They also experienced a relative decrease when compare to wives with less than 12 years of education and high welfare probability.

Table 10 repeats the means comparison analysis for husbands' labor force participation and hours of work. No significant difference is found within nor across groups.

The analysis is then repeated using a regression framework. For each of the two education groups, a separate DD regression is estimated. This regression is identical to the one estimated for the entire sample in the initial grouping, where the treatment effect is defined as the interaction of the time dummy and the welfare probability. The regressions results are presented in Tables 11a and 11b, for those with 12 years of education and those with less than 12 years of education, respectively. The first column indicates whether the regression corresponds to the husbands or the wives. The second column shows the number of observations used in the regression. The labor force participation treatment effects are shown in the third column. The fourth column presents the hours worked effects.

[25] Average monthly household earnings for families where the husband or the wife has 12 years of education are between the old and the new gross income limits.

The results are similar to those obtained through the means comparisons. Among wives with 12 years of education, those with high welfare probability experienced a reduction in labor force participation and hours of work, significant at a 10 percent level. The relative reduction in hours of worked is estimated to correspond to 1.62 hours per week or 21.6 percent of mean hours worked by this group in 1982 (7.49 hr./w). The estimated reduction in labor force participation corresponds to 4.6 percentage points. It is estimated by multiplying the slope of the probability function times one standard deviation of the interaction variable. All other results are insignificant.

To combine the within and across group analysis, a DDD regression is estimated using the entire sample. This regression includes time, education group, and welfare probability interactions for the two lower education groups. Since almost all the observations with high welfare probability are in these two groups, the time and welfare first order interaction is excluded due to multicollinearity. Separate labor force participation probit regressions and hours of work linear regressions are estimated for husbands and wives.

The results of these regressions are presented in Table 12. The estimated participation effect for wives with 12 years of education and high welfare probability corresponds to a reduction of 2.8 percentage points. This effect is significant at a 10 percent level. The estimated reduction in hours worked for this group is 1.17 hours per week. This reduction is significant at a 5 percent level. The estimated effects for all other groups are insignificantly different from zero.

8. Concluding Remarks

The results indicate that the tightening of eligibility restrictions did not produce an increase in the labor supply of married couples. In fact, there is some evidence indicating that the labor supply of married women may have decreased as a response to the reform.

After controlling for education there is no significant difference between husbands with high and low welfare probability. Husbands' labor supply does not seem to be affected by the reform. Wives, on the other hand, may have experienced a decrease in total hours worked.

There is a significant decrease in hours worked for wives with high welfare probability among those with 12 years of education. Education affects both, earnings and welfare participation. Therefore, wives with 12 years of education are the most likely to locate in the middle segment of the budget constraint and have a high welfare probability at the same time.

Wives with high welfare probability and husband's earnings within $300 of the new limit also experienced a reduction in labor supply. This reduction in labor supply seems to indicate that some households decided to decrease labor supply in order to avoid becoming ineligible for the program. The decrease in hours worked is estimated to range between 1.2 and 1.7 hours per week. If mean hours worked per week by all wives in the sample is used as the base (8.97 hours per week), the resulting estimated effect corresponds to a percentage reduction between 13.4 and 18.9 percent. The estimated reduction in labor force participation ranges between 3.5 and 4.5 percentage points.

Even though the labor supply reduction experienced by the affected group is substantial, this group comprised a small portion of the total population. Approximately 23 percent of wives have husbands' earnings within $300 of the new limit. This group has mean estimated welfare probability of 0.35. Those with 12 years of education comprised approximately 30 percent of the sample with an average welfare probability of 0.25. These numbers imply that approximately between 7.5 to 8 percent of the wives in the sample are expected to decrease their labor supply due to the reform.

Even though the tightening of eligibility requirements significantly decreased participation in the food assistance program, the analysis presented indicates that this reduction did not produce an increase in labor supply. The lack of response from these households may be due to low labor supply elasticities or to labor market constraints. This last explanation seems likely given the reduction in labor supply experienced by workers with low education relative to college graduates, in the sample.

As explained in section 3, by 1983 most industries in Puerto Rico were required to pay the federal minimum wage. The labor market time trends presented in Figure 4 can be used to investigate whether or not the minimum wage legislation has been a factor contributing to the decline in the labor supply of less educated workers. If the minimum wage has contributed to the deterioration of labor market conditions for less educated workers, then we should see changes in labor supply trends after 1983.

It is interesting to notice that between 1983 and 1986 the average wage for wives seems to converge for all groups except for college graduates. The labor supply of those with 11 years of education or less experienced very little change through this period. Clearly, those with 12 years or between 12 and 16 years of education behave differently between 1983 and 1986 than those with 16 years of education or more.

During the same period all groups of husbands, except for college graduates, decreased labor force participation. Even though all groups increased hours of work between 1982 and 1983, all groups except for college graduates experience a decrease after 1983. These time trends show a divergence of college graduates from all other

education groups right after 1983. The tightening of minimum wage legislation in 1983 may be an explanation for differences in labor market trends across education groups. It may also help explain why we do not see an increase in labor supply, even though the caseload decreased due to the reform. The possible role of minimum wage legislation in the Puerto Rican labor market should be a topic for further research. It may help us better understand the role of demand forces in the labor market.

This analysis indicates that, in the presence of high unemployment, the tightening of eligibility restrictions would not increase labor supply and may even cause a net reduction in work effort. This implies that many households may suffer a decrease in net income.

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Table 1. Poverty Rates for Puerto Rico and the US for Selected Years

Year	PR Poverty Rate	US Poverty Rate
1969	67.5	13.7
1979	62.4	12.4
1989	58.9	13.1
1995	58.0	13.8

Source: Poverty rates for 1969, 1979 and 1989 were obtained from Tabulations from the Decennial Census, by the Bureau of the Census. The 1995 poverty rate for the US comes from CPS tabulations. The 1995 rate for Puerto Rico was obtained from an internal memo from PR's Department of Social Services.

Table 2. Labor Force Participation and Unemployment Rate for Puerto Rico, by Sex.

	Both Sexes		Males		Females	
Year	Participation	Unemploy.	articipation	Unemploy.	Participation	Unemploy.
1970	48.0	10.7	70.8	11.0	28.0	10.2
1971	48.4	11.6	70.8	11.8	28.5	11.0
1972	48.0	11.9	69.7	12.4	28.7	10.8
1973	47.6	11.6	68.7	12.2	28.6	10.4
1974	46.7	13.2	67.0	14.0	28.3	11.6
1975	44.9	18.1	64.6	19.8	27.0	14.5
1976	45.2	19.5	64.2	21.9	27.9	14.4
1977	44.8	19.9	63.3	22.1	28.0	15.5
1978	44.2	18.1	62.5	20.2	27.6	13.8
1979	43.4	17.0	61.5	19.5	27.2	12.0
1980	43.3	17.1	60.7	19.5	27.8	12.3
1981	42.7	19.9	59.8	22.6	27.5	14.6
1982	41.2	22.8	57.8	26.3	26.3	16.0
1983	41.8	23.4	58.2	26.7	27.2	17.0
1984	42.1	20.7	58.4	23.7	27.6	15.0
1985	42.3	21.8	58.4	24.7	27.9	16.2
1986	43.3	18.9	59.7	21.9	29.3	13.4
1987	44.1	16.8	59.7	19.4	30.4	12.4
1988	45.6	15.0	61.3	17.5	32.0	10.8
1989	45.4	14.6	61.4	16.9	31.7	10.8
1990	45.4	14.2	61.6	16.2	31.4	10.7
1991	46.1	16.0	62.1	17.9	32.2	12.7
1992	46.5	16.7	61.8	19.0	33.2	12.8

Source: Puerto Rico's Department of Labor, Statistical Analysis Division

Table 3. Monthly Gross Income Limit and Benefits Paid at the New Limit (Notch) by Family Size:

Family Size	Gross Income Limit (Pre-Reform)	Gross Income Limit (Post Reform)	Notch (Post Reform)
2	583	449	14.24
3	714	558	35.08
4	916	667	50.92
5	1085	775	62.00
6	1226	885	83.60
7	1396	993	86.68
8	1552	1102	105.52
9	1829	1211	124.36

Source: The pre-reform information was obtained from the Department of Health and Human Services, Food and Nutrition Services. The post-reform gross income limits were obtained from Puerto Rico's Department of Social Services. The value of the notch was calculated using the standard deduction and the full shelter deduction.

Table 4. Characteristics of the Sample:

Number of observations	6,239
household size	4.27
% of households predicted to receive welfare	28.91
Average years of education (wives)	10.35
Average years of education (husbands)	10.32
Average age (wives)	35.04
Average age (husbands)	38.20
labor force participation rate (wives)	25.68
labor force participation rate (husbands)	65.07
Average total weekly hours worked (wives)	8.97
Average total weekly hours worked (husbands)	23.93

Table 5. Characteristics of Working Husbands and Wives

	Husbands	Wives
Number of observations	4059	1602
% predicted to receive welfare	22.88	8.49
education	11.10	12.83
Age	37.95	35.35
monthly hours worked	158.12	150.33

Source: Author's Tabulations of a sample from the MHS Data (1982-1985)

Table 6. Differences in Differences Results by Welfare Participation Means Comparison Results[26]

6a. Wives Labor Force Participation

Group	1982	Post 1982	Change
welfare prob.≥ 0.50	0.078 (s.e.=0.012) (N=500)	0.074 (s.e.=0.007) (N=1319)	-0.004 (s.e.=0.012)
welfare prob.<0.50	0.324 (s.e.=0.014) (N=1158)	0.334 (s.e.=0.008) (N=3262)	0.010 (s.e.=0.016)
Diff's in Diff's Groups (1)-(2)			-0.014 (s.e.=0.020)

6b. Wives Total Hours Worked

Group	1982	Post 1982	Change
welfare prob.≥ 0.50	2.46 (s.e.=0.40)	2.48 (s.e.=0.25)	0.02 (s.e.=0.47)
welfare prob.<0.50	10.62 (s.e.=0.47)	12.02 (s.e.=0.30)	1.40 (s.e.=0.74)
Diff's in Diff's Groups (1)-(2)			-1.38hrs/w (s.e.=0.88)*

6c. Husbands Labor Force Participation

Group	1982	Post 1982	Change
Welfare prob.≥ 0.50	0.554 (s.e.=0.022) (N=500)	0.499 (s.e.=0.014) (N=1319)	-0.055 (s.e.=0.026)
welfare prob.<0.50	0.749 (s.e.=0.013) (N=1158)	0.692 (s.e.=0.008) (N=3262)	-0.057 (s.e.=0.016)
Diff's in Diff's Groups (1)-(2)			0.003 (s.e.=0.031)

[26] * Statistically Significant at a 10% level
** Statistically Significant at a 5 % level.

6d. Husbands Total Hours Worked

Group	1982	Post 1982	Change
Welfare prob.≥ 0.50	18.87	17.37	-1.50
	(s.e.=0.81)	(s.e.=0.51)	(s.e.=0.96)*
Welfare prob.<0.50	27.06	26.24	-0.82
	(s.e.=0.49)	(s.e.=0.32)	(s.e.=0.58)*
Diff's in Diff's Groups (1)-(2)			-0.68 hrs/w
			(s.e.=1.12)

6e. Regressions Results:

(Treatment Effect = Interaction Coef. Time Dummy * Welfare Probability)

	Participation Effect		Hours Effect	
Wives	Coef.	-0.220	Coef.	-4.44
	dP/dX	-0.062	P-value	(0.004)**
	P-value	(0.24)	Effect Size	-1.2 hrs/w
Husbands	Coef.	0.026	Coef.	-2.71
	dP/dX	0.010	P-value	(0.15)
	P-value	(0.85)	Effect Size	-0.73 hrs/w

Table 7. Differences in Differences in Differences Results:
(Interaction Coef. of Time Dummy * Welfare Probability * Probability of being in a specific segment of the budget constraint.)

Regression Results with Two Treatment Groups

	Treatment: Time Dummy* Welfare Prob*	Participation Effect		Hours Effect	
Wives	Prob. Household's Earnings	Coef.	-1.95	Coef.	0.52
	Bet./ NAP & FS Limit	dP/dX	-0.56	P-value	(0.85)
		P-value	(0.29)	Effect Size	0.02 hrs/w
	Prob. Household's Earnings	Coef.	0.16	Coef.	-3.16
	Below NAP Limit	dP/dX	0.05	P-value	(0.83)
		P-value	(0.29)	Effect Size	-1.14 hrs/w
Husbands	Prob. Household's Earnings	Coef.	-1.81	Coef.	-27.44
	Bet./ NAP & FS Limit	dP/dX	-0.66	P-value	(0.13)
		P-value	(0.20)	Effect Size	-1.1 hrs/w
	Prob. Household's Earnings	Coef.	0.27	Coef.	5.13
	Below NAP Limit	dP/dX	0.10	P-value	(0.12)
		P-value	(0.28)	Effect Size	1.85 hrs/w

Table 8. Differences in Differences in Differences Results:
(Interaction Coef. of Time Dummy * Welfare Probability * Husband's Earnings Dummy.)

8a. Regression Results Using 2 Treatment Groups.

Treatment: Time Dummy* Welfare Prob. *	Wives Participation Effect		Wives Hours Effect	
Dummy =1 if Husband's Earnings are within $300 of NAP Limit	Coef. dP/dX P-value	-0.812 -0.228 (0.09)*	Coef. P-value Effect Size	-7.58 (0.06) * -1.2 hrs/w
Dummy =1 if Husband's Earnings Bet./ Nap limit & FS limit.	Coef. dP/dX P-value	-0.400 -0.112 (0.54)	Coef. P-value Effect Size	-3.60 (0.55) -0.32

8b. Regression Results Using 3 Treatment Groups

Treatment: Time Dummy *Welfare Prob. *	Wives Participation Effect		Wives Hours Effect	
Dummy =1 if Husband's Earnings are Within $300 of NAP limit	Coef. dP/dX P-value	-0.812 -0.227 (0.09)*	Coef. P-value Effect Size	-7.56 (0.06)* 1.2 hrs/w
Dummy =1 if Husband's Earnings are Bet./ Nap limit & Midpoint.	Coef. dP/dX P-value	-1.08 -0.302 (0.19)	Coef. P-value Effect Size	-8.14 (0.28) 0.6 hrs/w
Dummy =1 if Husband's Earnings are Bet./ Midpoint & FS limit	Coef. dP/dX P-value	0.596 0.167 (0.57)	Coef. P-value Effect Size	5.42 (0.59) 0.3 hrs/w

Table 9. Differences in Differences Results for Wives, by Welfare Probability within Education levels

Means Comparisons Results

9a. Labor Force Participation -Wives with 12 Years of Education.

	1982	Post 1982	Change
Wives with 12 yrs. of Education & welfare prob. = 0.50	0.211 (s.e.=0.054) (N=57)	0.113 (s.e.=0.025) (N=168)	-0.098 (s.e.=0.06)
Wives with 12 yrs. of Education & welfare prob.< 0.50	0.320 (s.e.=0.022) (N=441)	0.326 (s.e.=0.014) (N=1196)	0.006 (s.e.=0.026)
Diff's in Diff's (1)-(2)			-0.104 (s.e.=0.066)**

9b. Labor Force Participation - Wives with Less Than 12 Years of Education

	1982	Post 1982	Change
Wives with < 12 yrs. of Educ. & welfare prob. = 0.50	0.054 (s.e.=0.01) (N=392)	0.065 (s.e.=0.01) (N=1015)	0.011 (s.e.=0.01)
Wives with < 12 yrs. of Educ. & welfare prob.< 0.50	0.162 (s.e.=0.02) (N=377)	0.161 (s.e.=0.01) (N=1096)	-0.001 (s.e.=0.02)
Diff's in Diff's			0.012 (s.e.=0.03)

9c. Across Group Comparison

Diff's in Diff's (Educ.=12 & welf. = 0.50) - (Educ<12 & welf. = 0.50)	-0.109 (s.e.=0.06)**

9d. Hours of Work - Wives with 12 Years of Education

	1982	Post 1982	Change
Wives with 12 yrs. of Education & welfare prob. = 0.50	7.49 (s.e.=1.97)	4.05 (s.e.=0.88)	-3.44 (s.e.=4.67)
Wives with 12 yrs. of Education & welfare prob.< 0.50	10.97 (s.e.=0.78)	12.03 (s.e.=0.51)	1.06 (s.e.=0.94)
Diff's in Diff's			-4.5 hrs/w (s.e.=2.36)**

9e. Hours of Work - Wives with Less Than 12 Years of Education

	1982	Post 1982	Change
Wives with < 12 yrs. of Educ. & welfare prob. = 0.50	1.57 (s.e.=0.36)	2.12 (s.e.=0.26)	0.55 (s.e.=0.44)
Wives with < 12 yrs. of Educ. & welfare prob.< 0.50	5.55 (s.e.=0.67)	5.69 (s.e.=0.40)	0.14 (s.e.=0.78)
Diff's in Diff's			0.41 hrs/w (s.e.=0.90)

9f. Across Group Comparison

Diff's in Diff's (Educ.=12 & welf. = 0.50) - (Educ<12 & welf. = 0.50)	-3.99 hrs/w (s.e.=2.53)*

Table 10. Differences in Differences Results for Husbands, by Welfare Probability within Education levels

Means Comparisons Results

10a. Labor Force Participation - Husbands with 12 Years of Education

	1982	Post 1982	Change
Husbands with 12 yrs. of Education & welfare prob. = 0.50	0.703 (s.e.=0.058) (N=64)	0.694 (s.e.=0.038) (N=169)	-0.099 (s.e.=0.069)
Husbands with 12 yrs. of Education & welfare prob.< 0.50	0.788 (s.e.=0.019) (N=467)	0.713 (s.e.=0.013) (N=1295)	-0.075 (s.e.=0.023)
Diff's in Diff's			-0.024 (s.e.=0.072)

10b. Labor Force Participation - Husbands with Less Than 12 Years of Education

	1982	Post 1982	Change
Husbands with < than 12 yrs. of Educ. & welfare prob. = 0.50	0.527 (s.e.=0.025) (N=402)	0.483 (s.e.=0.016) (N=1035)	-0.044 (s.e.=0.029)
Husbands with < than 12 yrs. of Educ. & welfare prob.< 0.50	0.612 (s.e.=0.026) (N=467)	0.563 (s.e.=0.016) (N=1009)	-0.049 (s.e.=0.03)
Diff's in Diff's			0.005 (s.e.=0.042)

10c. Across Group Comparison

Diff's in Diff's (Educ.=12 & welf. = 0.50) - (Educ<12 & welf. = 0.50)	-0.055 (s.e.=0.074)

10d. Hours of Work - Husbands with 12 Years of Education

	1982	Post 1982	Change
Husbands with 12 yrs. of Education & welfare prob. = 0.50	25.94 (s.e.=2.21)	22.28 (s.e.=1.47)	-3.66 (s.e.=2.65)
Husbands with 12 yrs. of Education & welfare prob.< 0.50	29.18 (s.e.=0.74)	27.32 (s.e.=0.50)	-1.86 (s.e.=0.89)
Diff's in Diff's			-1.8 hrs/w (s.e.=2.80)

10e. Hours of Work - Husbands with Less Than 12 Years of Education

	1982	Post 1982	Change
Husbands with < 12 yrs. of Educ. & welfare prob. = 0.50	17.68 (s.e.=0.89)	16.57 (s.e.=0.57)	-1.11 (s.e.=1.05)
Husbands with < 12 yrs. of Educ. & welfare prob.< 0.50	21.86 (s.e.=1.00)	20.78 (s.e.=0.60)	-1.08 (s.e.=1.16)
Diff's in Diff's			-0.03 hrs/w (s.e.=1.57)

10f. Across Group Comparison

Diff's in Diff's (Educ.=12 & welf. = 0.50) - (Educ<12 & welf. = 0.50)	-2.55 hrs/w (2.84)

Table 11. Differences in Differences Regression Results by Welfare Probability Within Education Group

11a. Regression Results for Wives and Husbands with 12 Years of Education

(Interaction Coef. of Time Dummy * Welfare Probability)

Treatment: Time Dummy* Welfare Probability	# of obs.	Participation Effect		Hours Effect	
Wives	1,862	Coef.	-0.705	Coef.	-8.52
		dP/dX	-0.241	P-value	(0.08)*
		P-value	(0.09)*	Effect size	-1.62 hrs/w
Husbands	1,995	Coef.	-0.065	Coef.	-3.68
		dP/dX	-0.021	P-value	(0.44)
		P-value	(0.86)	Effect size	-0.70 hrs/w

11b. Regression Results for Wives and Husbands with less than 12 Years of Education

Treatment:. Time Dummy* Welfare Probability	# of obs.	Participation Effect		Hours Effect	
Wives	2,942	Coef.	0.039	Coef.	-0.269
		dP/dX	0.006	P-value	(0.88)
		P-value	(0.90)	Effect size	-0.08 hrs/w
Husbands	2,885	Coef.	-0.045	Coef.	-1.69
		dP/dX	-0.018	P-value	(0.60)
		P-value	(0.84)	Effect size	-0.51 hrs/w

Table 12. Differences in Differences in Differences Results:

(Interaction Coef. of Time Dummy *Welfare Probability * Education Group Dummy)

	Treatment: Time Dummy*Welfare Probability *	Participation Effect		Hours Effect	
Wives	Group Dummy (Educ.=12)	Coef.	-0.731*	Coef.	-8.62**
		dP/dX	-0.210	P-value	(0.03)
		P-value	(0.08)	Effect size	-1.17 hrs/w
	Group Dummy (Educ.<12)	Coef.	0.021	Coef.	-0.218
		dP/dX	0.006	P-value	(0.93)
		P-value	(0.95)	Effect size	-0.06 hrs/w
Husbands	Group Dummy (Educ.=12)	Coef.	-0.089	Coef.	-4.01
		dP/dX	-0.033	P-value	(0.41)
		P-value	(0.81)	Effect size	-0.56 hrs/w
	Group Dummy (Educ.<12)	Coef.	-0.048	Coef.	-1.72
		dP/dX	-0.017	P-value	(0.58)
		P-value	(0.83)	Effect size	-0.48 hrs/w

Figure 1

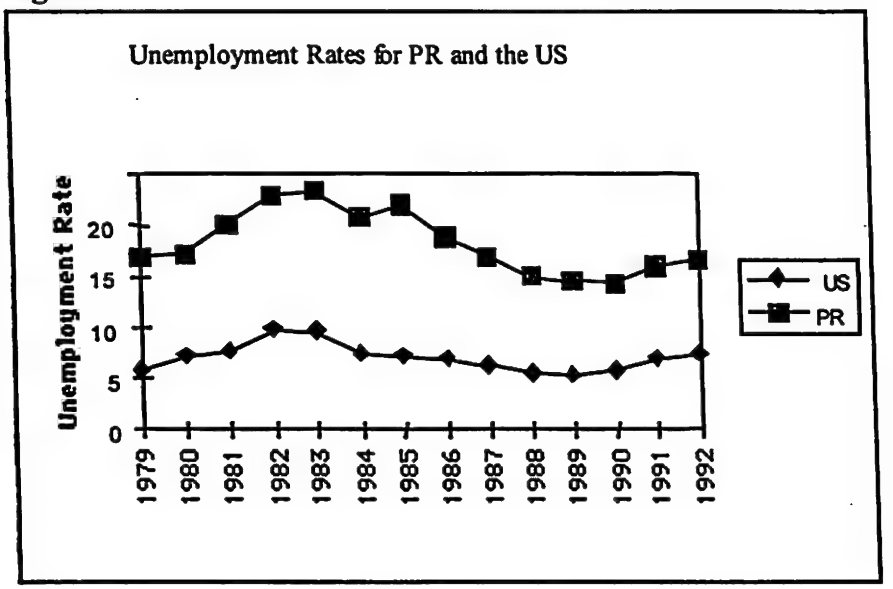


Figure 2

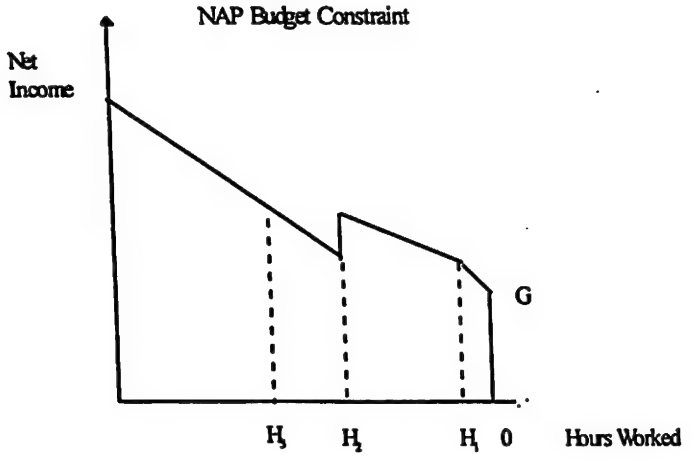


Figure 3

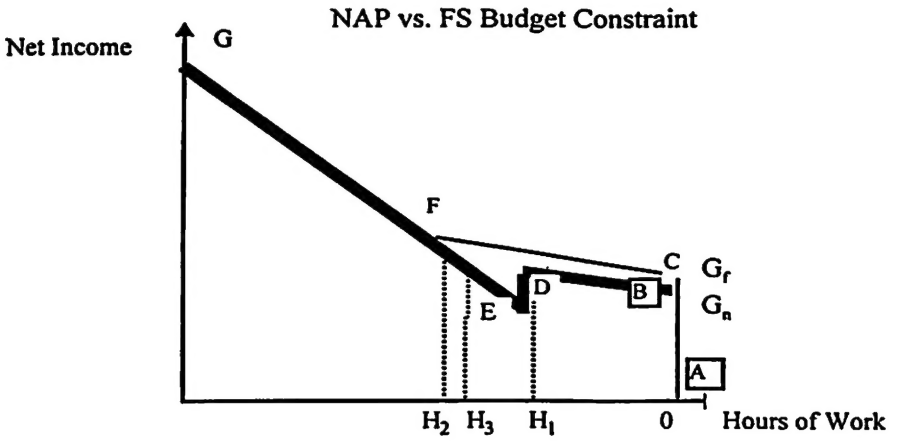
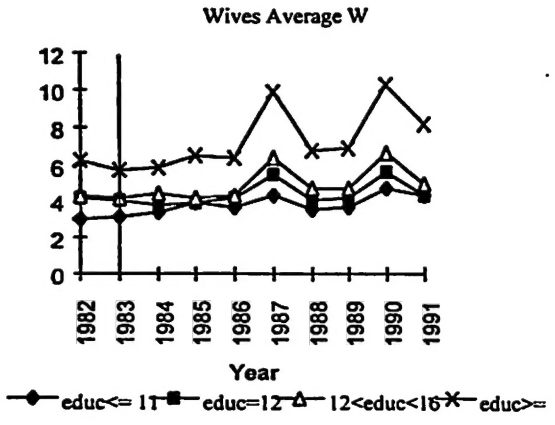
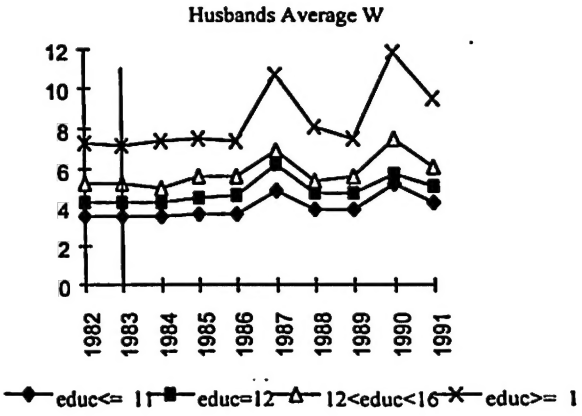
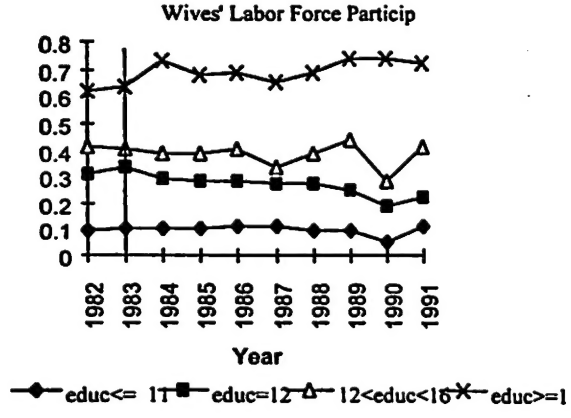
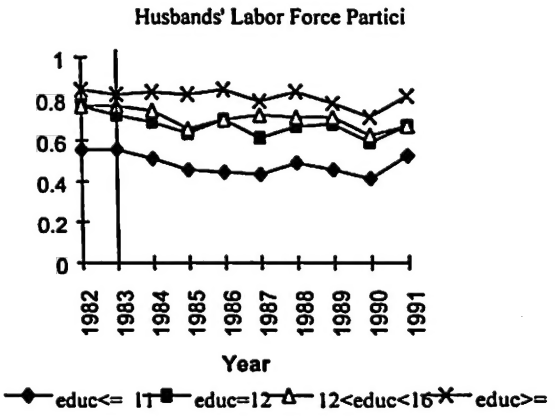
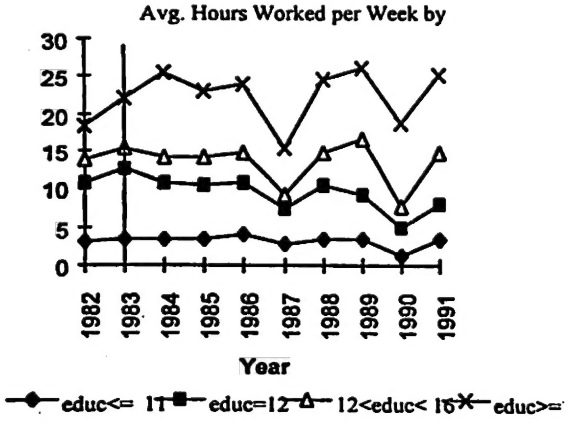
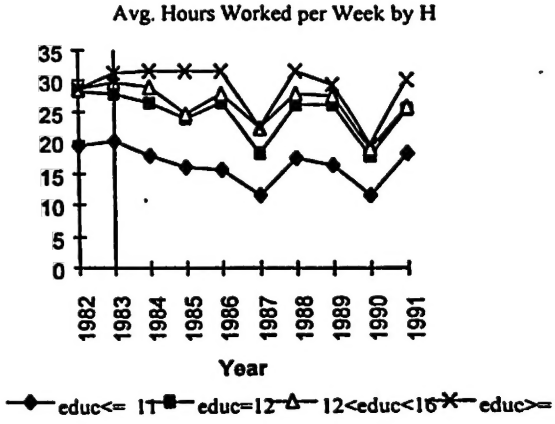

NAP vs. FS Budget Constraint
Net Income
G
F
C
G_f
D
B
E
G_n
A
H_2
H_3
H_1
0
Hours of Work

Figure 4

Trends in Average Wage, Labor Force Participation and Hours Worked per Week